ANNEXES

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Annex 1 Key Categories

A1.1. Description of methodology used for identifying key sources

The IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC, 2000) recommend as good practice the identification of key source categories of emissions. As a result of the adoption (Decision 13/CP.9) of the LULUCF Good Practice Guidance (IPCC, 2003) the concept of key sources has been expanded in order to cover LULUCF emissions by sources and removals by sinks. Therefore the term key category is used in order to include both sources and sinks.

Generally, inventory uncertainty is lower when emissions are estimated using the available most rigorous methods, but due to finite resources this may not be feasible for every category. Therefore it is good practice to identify those categories (key categories) that have the greatest contribution to overall inventory uncertainty in order to make the most efficient use of available resources. In that context, a "key category" is one that is prioritised within the national inventory system because its estimate has a significant influence on a country's total inventory of direct greenhouse gases in terms of the absolute level of emissions (level assessment) or/and to the trend of emissions (trend assessment).

This annex describes the key category analysis conducted for the 2005 Hungarian inventory. Good practice first requires that inventories be disaggregated into categories from which key sources and sinks may be identified. Adopting the categorization of sources/sinks that is presented in table 5.4.1 of the IPCC Good Practice Guidance for LULUCF (IPCC, 2003) analysis of key categories was conducted according to the Tier1 methodology described in the IPCC Good Practice Guidance. This approach identifies key categories from two perspectives. The first analyzes the emission contribution that each category makes to the national total (with and without LULUCF). The second perspective analyzes the trend of emission contributions from each category to identify where the greatest absolute changes (either increases or reductions) have taken place over a given time (with and without LULUCF categories). The percent contributions to both levels and trends in emissions are calculated and sorted from greatest to least. A cumulative total is calculated for both approaches. IPCC has determined that a cumulative contribution threshold of 95% for both level and trend assessments is a reasonable approximation of 90% uncertainty for the Tier 1 method of determining key categories (IPCC, 2000). The 95% cumulative contribution threshold has been used in this analysis to define an upper boundary for key category identification. Therefore, when source and/or sink contributions are sorted in decreasing order of importance, those that contribute to 95% of the cumulative total are considered quantitatively to be key. Results for these analysis are shown in *Table A1-2*, *Table A1-3*, *Table A1-4*, *Table A1-5*.

Since uncertainty estimates are not available for the LULUCF sector Tier 2 method was applied to find key categories only for source categories (without LULUCF). The required uncertainty values for source categories are listed in *Table A7-1*. The calculation was performed using the spreadsheet 6.1 described in the IPCC Good Practice Guidance (IPCC, 2000). The percent contributions to both levels and trends in emissions are calculated and sorted from greatest to least. A cumulative total is calculated for both approaches and the key source categories are identified by accounting for those that add up to 90 % of the cumulative total. Results from Tier 2 approach can be seen in *Table A1-6*, *Table A1-7.*

A1.2. Reference to the key source tables in the CRF

Table A1-1. *IPCC source/sink categories*

CRF code	IPCC Source/Sink Categories	Direct Greenhouse Gas
1. A	Stationary Combustion - Gas	CO_2
1. A	Stationary Combustion - Coal	CO_2
1. A	Stationary Combustion - Oil	CO_2
1. A	Non-CO_2 Emission from Stationary Fuel Combustion	N_2O
1. A	Non-CO_2 Emission from Stationary Fuel Combustion	CH_4
1. A	Stationary Combustion - Other Fuel	CO_2
1. A. 3	Mobile Combustion	N_2O
1. A. 3	Mobile Combustion - Other	CO_2
1. A. 3	Mobile Combustion	CH_4
1. A. 3. B	Mobile Combustion - Road Vehicles	CO_2
1. B. 1	Fugitive Emissions from Coal Mining and Handling	CH_4
1. B. 1	Fugitive Emissions from Oil and Gas Operations	CO_2
1. B. 2	Fugitive Emissions from Oil and Gas Operations (Main Source: Gas Distribution)	CH_4
1. B. 2	Fugitive Emissions from Oil and Gas Operations	CO_2
2.	N_2O Emission from Industry	N_2O
2.	CH_4 Emission from Industry	CH_4
2. A. 1	CO_2 Emissions from Cement Production	CO_2
2. A. 2	CO_2 Emissions from Lime Production	CO_2
2. A. 3	CO_2 Emission from Limestone and Dolomit Use	CO_2
2. A. 7	CO_2 Emission from Other Mineral Products	CO_2
2. B. 1	CO_2 Emissions from Ammonia Processes	CO_2
2. B. 2	CO_2 Emissions from Nitric Acid Production	CO_2
2. C	CO_2 Emissions from Metal Production	CO_2
2. C. 3	PFCs Emissions from Industry	PFCs
2. F	Emissions from Substitutes for Ozone Depleting Substances	HFCs
2. F. 7	SF_6 Emissions from Electrical Equipment	SF_6
3.	N_2O Emission from Solvent and Other Product Use	N_2O
3.	CO_2 Emission from Solvent and Other Product Use	CO_2
4. A	CH_4 Emissions from Enteric Fermentation in Domestic Livestock	CH_4
4. B	CH_4 Emissions from Manure Management	CH_4
4. B	N_2O Emissions from Manure Management	N_2O
4. C	CH_4 Emission from Rice Cultivation	CH_4
4. D. 1	Direct N_2O Emissions from Agricultural Soils	N_2O
4. D. 2	Animal Production	N_2O
4. D. 3	Indirect N_2O Emissions from Nitrogen Used in Agriculture	N_2O

Table A1-1. *IPCC source/sink categories*

CRF code	IPCC Source/Sink Categories	Direct Greenhouse Gas
4. F	Field Burning of Agricultural Residues	N_2O
4. F	Field Burning of Agricultural Residues	CH_4
5. A. 1	Forest Land Remaining Forest Land	CO_2
5. A. 1	Forest Land Remaining Forest Land	CH_4
5. A. 1	Forest Land Remaining Forest Land	N_2O
5. A. 2	Conversion to Forest Land	CO_2
5. B. 1	Croplands Remaining Croplands and Emission from Lime Application	CO_2
5. C. 2	Conversion to Grassland	CO_2
5. F. 2	Conversion to Other Land	CO_2
6. A	CH_4 Emissions from Solid Waste Disposal Sites	CH_4
6. B	Emissions from Wastewater Handling	CH_4
6. B	Emissions from Wastewater Handling	N_2O
6. C	Non-biogenic CO_2 from Waste	CO_2
6. C	Emissions from Waste Incineration	N_2O

A1.3. Results of the key category analysis

Table A1-2. *Key Categories without LULUCF, Tier 1 Level Assessment*

IPCC Categories	Direct Greenhouse Gas	Emission (Gg)	Emission (Gg CO_2 eq.)	Level Assessment	Cumulative Total
Stationary Combustion - Gas	**CO_2**	**27,980.57**	**27,980.57**	**0.349**	**0.349**
Stationary Combustion - Coal	**CO_2**	**13,149.58**	**13,149.58**	**0.164**	**0.513**
Mobile Combustion - Road Vehicles	**CO_2**	**11,603.23**	**11,603.23**	**0.145**	**0.657**
Stationary Combustion - Oil	**CO_2**	**5,062.38**	**5,062.38**	**0.063**	**0.720**
Direct N_2O Emissions from Agricultural Soils	**N_2O**	**10.42**	**3,230.41**	**0.040**	**0.761**
CH_4 Emissions from Solid Waste Disposal Sites	**CH_4**	**136.10**	**2,858.10**	**0.036**	**0.796**
Fugitive Emissions from Oil and Gas Operations (Main Source: Gas Distribution)	**CH_4**	**97.53**	**2,048.12**	**0.026**	**0.822**
Indirect N_2O Emissions from Nitrogen Used in Agriculture	**N_2O**	**6.49**	**2,011.70**	**0.025**	**0.847**
N_2O Emission from Industry	**N_2O**	**6.26**	**1,940.98**	**0.024**	**0.871**
CH_4 Emissions from Enteric Fermentation in Domestic Livestock	**CH_4**	**70.13**	**1,472.70**	**0.018**	**0.890**
CO_2 Emissions from Cement Production	**CO_2**	**1,198.75**	**1,198.75**	**0.015**	**0.904**
N_2O Emissions from Manure Management	**N_2O**	**3.64**	**1,127.39**	**0.014**	**0.919**
CO_2 Emissions from Ammonia Processes	**CO_2**	**822.38**	**822.38**	**0.010**	**0.929**
Emissions from Wastewater Handling	**CH_4**	**27.33**	**574.02**	**0.007**	**0.936**
Emissions from Substitutes for Ozone Depleting Substances	**HFCs**	**----**	**517.58**	**0.006**	**0.942**
Non-CO_2 Emission from Stationary Fuel Combustion	**N_2O**	**1.53**	**475.27**	**0.006**	**0.948**
Mobile Combustion	**N_2O**	**1.37**	**424.77**	**0.005**	**0.954**
CH_4 Emissions from Manure Management	CH_4	19.53	410.17	0.005	0.959
CO_2 Emission from Other Mineral Products	CO_2	338.33	338.33	0.004	0.963
Non-CO_2 Emission from Stationary Fuel Combustion	CH_4	16.08	337.70	0.004	0.967

Table A1-2. *Key Categories without LULUCF, Tier 1 Level Assessment*

IPCC Categories	Direct Greenhouse Gas	Emission (Gg)	Emission (Gg CO_2 eq.)	Level Assessment	Cumulative Total
CO_2 Emission from Limestone and Dolomit Use	CO_2	332.49	332.49	0.004	0.971
CO_2 Emissions from Lime Production	CO_2	323.14	323.14	0.004	0.975
CO_2 Emissions from Metal Production	CO_2	310.72	310.72	0.004	0.979
Non-biogenic CO_2 from Waste	CO_2	297.23	297.23	0.004	0.983
Emissions from Wastewater Handling	N_2O	0.68	210.80	0.003	0.986
PFCs Emissions from Industry	PFCs	----	209.39	0.003	0.988
SF_6 Emissions from Electrical Equipment	SF_6	----	201.02	0.003	0.991
Animal Production	N_2O	0.65	200.91	0.003	0.993
Mobile Combustion - Other	CO_2	173.34	173.34	0.002	0.995
Fugitive Emissions from Oil and Gas Operations	CO_2	84.92	84.92	0.001	0.996
N_2O Emission from Solvent and Other Product Use	N_2O	0.27	82.75	0.001	0.997
CO_2 Emission from Solvent and Other Product Use	CO_2	65.49	65.49	0.001	0.998
Stationary Combustion - Other Fuel	CO_2	64.88	64.88	0.001	0.999
Mobile Combustion	CH_4	1.34	28.22	0.000	0.999
Fugitive Emissions from Coal Mining and Handling	CH_4	1.04	21.92	0.000	1.000
CH_4 Emission from Industry	CH_4	0.69	14.56	0.000	1.000
CH_4 Emission from Rice Cultivation	CH_4	0.53	11.19	0.000	1.000
Emissions from Waste Incineration	N_2O	0.005	1.66	0.000	1.000
CO_2 Emissions from Nitric Acid Production	CO_2	0.080	0.08	0.000	1.000
Fugitive Emissions from Coal Mining and Handling	CO_2		0.00	0.000	1.000
Field Burning of Agricultural Residues	N_2O		0.00	0.000	1.000
Field Burning of Agricultural Residues	CH_4		0.00	0.000	1.000

Table A1-3. *Key Categories with LULUCF, Tier 1 Level Assessment*

IPCC Categories	Direct Greenhouse Gas	Net Emission (Gg)	Net Emission (Gg CO_2 eq.)	Net Emission – Absolute Value (Gg CO_2 eq.)	Level Assessment	Cumulative Total
Stationary Combustion - Gas	**CO_2**	**27,980.57**	**27,980.57**	**27,980.57**	**0.320**	**0.320**
Stationary Combustion - Coal	**CO_2**	**13,149.58**	**13,149.58**	**13,149.58**	**0.150**	**0.471**
Mobile Combustion - Road Vehicles	**CO_2**	**11,603.23**	**11,603.23**	**11,603.23**	**0.133**	**0.604**
Forest Land Remaining Forest Land	**CO_2**	**-5,323.00**	**-5,323.00**	**5,323.00**	**0.061**	**0.664**
Stationary Combustion - Oil	**CO_2**	**5,062.38**	**5,062.38**	**5,062.38**	**0.058**	**0.722**
Direct N_2O Emissions from Agricultural Soils	**N_2O**	**10.42**	**3,230.41**	**3,230.41**	**0.037**	**0.759**
CH_4 Emissions from Solid Waste Disposal Sites	**CH_4**	**136.10**	**2,858.10**	**2,858.10**	**0.033**	**0.792**
Fugitive Emissions from Oil and Gas Operations (Main Source: Gas Distribution)	**CH_4**	**97.53**	**2,048.12**	**2,048.12**	**0.023**	**0.816**
Indirect N_2O Emissions from Nitrogen Used in Agriculture	**N_2O**	**6.49**	**2,011.70**	**2,011.70**	**0.023**	**0.839**
N_2O Emission from Industry	**N_2O**	**6.26**	**1,940.98**	**1,940.98**	**0.022**	**0.861**
CH_4 Emissions from Enteric Fermentation in Domestic Livestock	**CH_4**	**70.13**	**1,472.70**	**1,472.70**	**0.017**	**0.878**
Conversion to Other Land	**CO_2**	**1,283.33**	**1,283.33**	**1,283.33**	**0.015**	**0.892**
CO_2 Emissions from Cement Production	**CO_2**	**1,198.75**	**1,198.75**	**1,198.75**	**0.014**	**0.906**
N_2O Emissions from Manure Management	**N_2O**	**3.64**	**1,127.39**	**1,127.39**	**0.013**	**0.919**
CO_2 Emissions from Ammonia Processes	**CO_2**	**822.38**	**822.38**	**822.38**	**0.009**	**0.928**
Emissions from Wastewater Handling	**CH_4**	**27.33**	**574.02**	**574.02**	**0.007**	**0.935**
Emissions from Substitutes for Ozone Depleting Substances	**HFCs**	**----**	**517.58**	**517.58**	**0.006**	**0.941**
Non-CO_2 Emission from Stationary Fuel Combustion	**N_2O**	**1.53**	**475.27**	**475.27**	**0.005**	**0.946**
Conversion to Forest Land	**CO_2**	**-473.00**	**-473.00**	**473.00**	**0.005**	**0.952**
Mobile Combustion	N_2O	1.37	424.77	424.77	0.005	0.957

Table A1-3. *Key Categories with LULUCF, Tier 1 Level Assessment*

IPCC Categories	Direct Greenhouse Gas	Net Emission (Gg)	Net Emission (Gg CO_2 eq.)	Net Emission – Absolute Value (Gg CO_2 eq.)	Level Assessment	Cumulative Total
CH_4 Emissions from Manure Management	CH_4	19.53	410.17	410.17	0.005	0.961
CO_2 Emission from Other Mineral Products	CO_2	338.33	338.33	338.33	0.004	0.965
Non-CO_2 Emission from Stationary Fuel Combustion	CH_4	16.08	337.70	337.70	0.004	0.969
CO_2 Emission from Limestone and Dolomit Use	CO_2	332.49	332.49	332.49	0.004	0.973
CO_2 Emissions from Lime Production	CO_2	323.14	323.14	323.14	0.004	0.976
CO_2 Emissions from Metal Production	CO_2	310.72	310.72	310.72	0.004	0.980
Non-biogenic CO_2 from Waste	CO_2	297.23	297.23	297.23	0.003	0.983
Emissions from Wastewater Handling	N_2O	0.68	210.80	210.80	0.002	0.986
PFCs Emissions from Industry	PFCs	----	209.39	209.39	0.002	0.988
SF_6 Emissions from Electrical Equipment	SF_6	----	201.02	201.02	0.002	0.991
Animal Production	N_2O	0.65	200.91	200.91	0.002	0.993
Mobile Combustion - Other	CO_2	173.34	173.34	173.34	0.002	0.995
Fugitive Emissions from Oil and Gas Operations	CO_2	84.92	84.92	84.92	0.001	0.996
N_2O Emission from Solvent and Other Product Use	N_2O	0.27	82.75	82.75	0.001	0.997
CO_2 Emission from Solvent and Other Product Use	CO_2	65.49	65.49	65.49	0.001	0.997
Stationary Combustion - Other Fuel	CO_2	64.88	64.88	64.88	0.001	0.998
Mobile Combustion	CH_4	1.34	28.22	28.22	0.000	0.999
Croplands Remaining Croplands and Emission from Lime Application	CO_2	27.30	27.30	27.30	0.000	0.999
Forest Land Remaining Forest Land	CH_4	1.28	26.88	26.88	0.000	0.999
Fugitive Emissions from Coal Mining and Handling	CH_4	1.04	21.92	21.92	0.000	0.999
Conversion to Grassland	CO_2	-19.80	-19.80	19.80	0.000	1.000

Table A1-3. *Key Categories with LULUCF, Tier 1 Level Assessment*

IPCC Categories	Direct Greenhouse Gas	Net Emission (Gg)	Net Emission (Gg CO_2 eq.)	Net Emission – Absolute Value (Gg CO_2 eq.)	Level Assessment	Cumulative Total
CH_4 Emission from Industry	CH_4	0.69	14.56	14.56	0.000	1.000
CH_4 Emission from Rice Cultivation	CH_4	0.53	11.19	11.19	0.000	1.000
Forest Land Remaining Forest Land	N_2O	0.01	2.73	2.73	0.000	1.000
Emissions from Waste Incineration	N_2O	0.005	1.66	1.66	0.000	1.000
CO_2 Emissions from Nitric Acid Production	CO_2	0.080	0.08	0.08	0.000	1.000
Fugitive Emissions from Coal Mining and Handling	CO_2		0.00	0.00	0.000	1.000
Field Burning of Agricultural Residues	N_2O		0.00	0.00	0.000	1.000
Field Burning of Agricultural Residues	CH_4		0.00	0.00	0.000	1.000

Table A1-4. *Key Categories without LULUCF, Tier 1 Trend Assessment*

IPCC Categories	Direct Greenhouse Gas	Base Years (1985-87) Emission (Gg CO_2 eq.)	Current Year (2005) Emission (Gg CO_2 eq.)	Trend Assessment	% Contribution to Trend	Cumulative Total
Stationary Combustion - Gas	**CO_2**	**20,787.96**	**27,980.57**	**0.243**	**27.66**	**0.277**
Stationary Combustion - Coal	**CO_2**	**34,678.65**	**13,149.58**	**0.196**	**22.33**	**0.500**
Mobile Combustion - Road	**CO_2**	**6,807.45**	**11,603.23**	**0.123**	**14.04**	**0.640**
Stationary Combustion - Oil	**CO_2**	**16,628.08**	**5,062.38**	**0.116**	**13.24**	**0.773**
CH_4 Emissions from Solid Waste Disposal Sites	**CH_4**	**1,917.30**	**2,858.10**	**0.027**	**3.12**	**0.804**
N_2O Emission from Industry	**N_2O**	**4,541.51**	**1,940.98**	**0.022**	**2.48**	**0.829**
Indirect N_2O Emissions from Nitrogen Used in Agriculture	**N_2O**	**4,425.50**	**2,011.70**	**0.019**	**2.17**	**0.850**
Direct N_2O Emissions from Agricultural Soils	**N_2O**	**6,043.45**	**3,230.41**	**0.017**	**1.97**	**0.870**
Fugitive Emissions from Oil and Gas Operations (Main Source: Gas Distribution)	**CH_4**	**1,601.78**	**2,048.12**	**0.017**	**1.91**	**0.889**
CH_4 Emissions from Enteric Fermentation in Domestic Livestock	**CH_4**	**3,234.36**	**1,472.70**	**0.014**	**1.58**	**0.905**
Fugitive Emissions from Coal Mining and Handling	**CH_4**	**923.02**	**21.92**	**0.011**	**1.26**	**0.918**
CO_2 Emissions from Ammonia Processes	**CO_2**	**1,995.97**	**822.38**	**0.010**	**1.15**	**0.929**
N_2O Emissions from Manure Management	**N_2O**	**2,402.54**	**1,127.39**	**0.010**	**1.10**	**0.940**
Emissions from Substitutes for Ozone Depleting Substances	**HFCs**	**1.74**	**517.58**	**0.009**	**1.05**	**0.951**
Mobile Combustion - Other	CO_2	762.19	173.34	0.006	0.73	0.958
Mobile Combustion	N_2O	112.10	424.77	0.006	0.71	0.965
Non-biogenic CO_2 from Waste	CO_2	97.62	297.23	0.004	0.47	0.970
CH_4 Emissions from Manure Management	CH_4	889.57	410.17	0.004	0.42	0.974
CO_2 Emission from Limestone and Dolomit Use	CO_2	248.68	332.49	0.003	0.33	0.977
SF_6 Emissions from Electrical Equipment	SF_6	70.15	201.02	0.003	0.31	0.980
CO_2 Emissions from Metal Processes	CO_2	641.57	310.72	0.002	0.28	0.983

Table A1-4. *Key Categories without LULUCF, Tier 1 Trend Assessment*

IPCC Categories	Direct Greenhouse Gas	Base Years (1985-87) Emission (Gg CO_2 eq.)	Current Year (2005) Emission (Gg CO_2 eq.)	Trend Assessment	% Contribution to Trend	Cumulative Total
CO_2 Emissions from Lime Production	CO_2	645.03	323.14	0.002	0.25	0.986
Non-CO_2 Emissions from Stationary Fuel Combustion	N_2O	832.21	475.27	0.002	0.21	0.988
PFCs Emissions	PFCs	166.82	209.39	0.002	0.19	0.990
N_2O Emission from Solvent and Other Product Use	N_2O	253.77	82.75	0.002	0.19	0.992
Animal Production	N_2O	390.92	200.91	0.001	0.14	0.993
Emissions from Wastewater Handling	N_2O	207.70	210.80	0.001	0.14	0.994
Non-CO_2 Emissions from Stationary Fuel Combustion	CH_4	576.91	337.70	0.001	0.13	0.996
Fugitive Emissions from Oil and Gas Operations	CO_2	195.68	84.92	0.001	0.10	0.997
CO_2 Emission from Other Mineral Products	CO_2	529.48	338.33	0.001	0.06	0.997
Stationary Combustion - Other Fuel	CO_2	51.32	64.88	0.001	0.06	0.998
CO_2 Emissions from Cement Production	CO_2	1,765.31	1,198.75	0.000	0.06	0.998
CO_2 Emission from Solvent and Other Product Use	CO_2	130.68	65.49	0.000	0.05	0.999
CH_4 Emission from Rice Cultivation	CH_4	50.54	11.19	0.000	0.05	0.999
Emissions from Wastewater Handling	CH_4	847.03	574.02	0.000	0.03	1.000
CH_4 Emission from Industry	CH_4	7.84	14.56	0.000	0.02	1.000
Mobile Combustion	CH_4	45.35	28.22	0.000	0.01	1.000
N_2O Emissions from Waste Incineration	N_2O	0.69	1.66	0.000	0.00	1.000
CO_2 Emissions from Nitric Acid Production	CO_2	0.08	0.08	0.000	0.00	1.000
Fugitive Emissions from Coal Mining and Handling	CO_2	3.60	0.00		0.00	1.000
Field Burning of Agricultural Residues	CH_4	45.51	0.00		0.00	1.000
Field Burning of Agricultural Residues	N_2O	13.34	0.00		0.00	1.000

Table A1-5. *Key Categories with LULUCF, Tier 1 Trend Assessment*

IPCC Categories	Direct Greenhouse Gas	Base Years (1985-87) Emission (Gg CO_2 eq.)	Base Years (1985-87) Emission – Abs. Value (Gg CO_2 eq.)	Current Year (2005) Emission (Gg CO_2 eq.)	Current Year (2005) Emission – Abs. Value (Gg CO_2 eq.)	Trend Assess-ment	Contribu-tion to Trend %	Cumula-tive Total
Stationary Combustion - Gas	**CO_2**	**20,787.96**	**20,787.96**	**27,980.57**	**27,980.57**	**0.199**	**22.97**	**0.230**
Stationary Combustion - Coal	**CO_2**	**34,678.65**	**34,678.65**	**13,149.58**	**13,149.58**	**0.192**	**22.09**	**0.451**
Stationary Combustion - Oil	**CO_2**	**16,628.08**	**16,628.08**	**5,062.38**	**5,062.38**	**0.111**	**12.83**	**0.579**
Mobile Combustion - Road	**CO_2**	**6,807.45**	**6,807.45**	**11,603.23**	**11,603.23**	**0.103**	**11.92**	**0.698**
Forest Land Remaining Forest Land	**CO_2**	**-3,393.03**	**3,393.03**	**-5,323.00**	**5,323.00**	**0.044**	**5.11**	**0.749**
CH_4 Emissions from Solid Waste Disposal Sites	**CH_4**	**1,917.30**	**1,917.30**	**2,858.10**	**2,858.10**	**0.023**	**2.62**	**0.775**
N_2O Emission from Industry	**N_2O**	**4,541.51**	**4,541.51**	**1,940.98**	**1,940.98**	**0.022**	**2.50**	**0.800**
Conversion to Other Land	**CO_2**	**0.00**	**0.00**	**1,283.33**	**1,283.33**	**0.020**	**2.31**	**0.824**
Indirect N_2O Emissions from Nitrogen Used in Agriculture	**N_2O**	**4,425.50**	**4,425.50**	**2,011.70**	**2,011.70**	**0.019**	**2.22**	**0.846**
Direct N_2O Emissions from Agricultural Soils	**N_2O**	**6,043.45**	**6,043.45**	**3,230.41**	**3,230.41**	**0.019**	**2.16**	**0.867**
CH_4 Emissions from Enteric Fermentation in Domestic Livestock	**CH_4**	**3,234.36**	**3,234.36**	**1,472.70**	**1,472.70**	**0.014**	**1.62**	**0.884**
Fugitive Emissions from Oil and Gas Operations (Main Source: Gas Distribution)	**CH_4**	**1,601.78**	**1,601.78**	**2,048.12**	**2,048.12**	**0.014**	**1.58**	**0.899**
Fugitive Emissions from Coal Mining and Handling	**CH_4**	**923.02**	**923.02**	**21.92**	**21.92**	**0.010**	**1.18**	**0.911**
CO_2 Emissions from Ammonia Processes	**CO_2**	**1,995.97**	**1,995.97**	**822.38**	**822.38**	**0.010**	**1.15**	**0.923**
N_2O Emissions from Manure Management	**N_2O**	**2,402.54**	**2,402.54**	**1,127.39**	**1,127.39**	**0.010**	**1.14**	**0.934**
Emissions from Substitutes for Ozone Depleting Substances	**HFCs**	**1.74**	**1.74**	**517.58**	**517.58**	**0.008**	**0.93**	**0.943**
Mobile Combustion - Other	**CO_2**	**762.19**	**762.19**	**173.34**	**173.34**	**0.006**	**0.69**	**0.950**
Conversion to Forest Land	CO_2	141.67	141.67	-473.00	473.00	0.006	0.67	0.957
Mobile Combustion	N_2O	112.10	112.10	424.77	424.77	0.005	0.62	0.963
CH_4 Emissions from Manure Management	CH_4	889.57	889.57	410.17	410.17	0.004	0.44	0.967

Table A1-5. *Key Categories with LULUCF, Tier 1 Trend Assessment*

IPCC Categories	Direct Greenhouse Gas	Base Years (1985-87) Emission (Gg CO_2 eq.)	Base Years (1985-87) Emission – Abs. Value (Gg CO_2 eq.)	Current Year (2005) Emission (Gg CO_2 eq.)	Current Year (2005) Emission – Abs. Value (Gg CO_2 eq.)	Trend Assess-ment	Contribu-tion to Trend %	Cumula-tive Total
Non-biogenic CO_2 from Waste	CO_2	97.62	97.62	297.23	297.23	0.004	0.41	0.971
CO_2 Emissions from Metal Processes	CO_2	641.57	641.57	310.72	310.72	0.002	0.29	0.974
CO_2 Emission from Limestone and Dolomit Use	CO_2	248.68	248.68	332.49	332.49	0.002	0.27	0.977
SF_6 Emissions from Electrical Equipment	SF_6	70.15	70.15	201.02	201.02	0.002	0.27	0.980
CO_2 Emissions from Lime Production	CO_2	645.03	645.03	323.14	323.14	0.002	0.27	0.982
Non-CO_2 Emissions from Stationary Fuel Combustion	N_2O	832.21	832.21	475.27	475.27	0.002	0.24	0.985
N_2O Emission from Solvent and Other Product Use	N_2O	253.77	253.77	82.75	82.75	0.002	0.19	0.987
CO_2 Emissions from Cement Production	CO_2	1,765.31	1,765.31	1,198.75	1,198.75	0.001	0.17	0.988
PFCs Emissions	PFCs	166.82	166.82	209.39	209.39	0.001	0.16	0.990
Animal Production	N_2O	390.92	390.92	200.91	200.91	0.001	0.15	0.992
Non-CO_2 Emissions from Stationary Fuel Combustion	CH_4	576.91	576.91	337.70	337.70	0.001	0.15	0.993
Emissions from Wastewater Handling	N_2O	207.70	207.70	210.80	210.80	0.001	0.11	0.994
Fugitive Emissions from Oil and Gas Operations	CO_2	195.68	195.68	84.92	84.92	0.001	0.11	0.995
CO_2 Emission from Other Mineral Products	CO_2	529.48	529.48	338.33	338.33	0.001	0.09	0.996
Emissions from Wastewater Handling	CH_4	847.03	847.03	574.02	574.02	0.001	0.08	0.997
Croplands Remaining Croplands and Emission from Lime Application	CO_2	100.91	100.91	27.30	27.30	0.001	0.08	0.998
CO_2 Emission from Solvent and Other Product Use	CO_2	130.68	130.68	65.49	65.49	0.000	0.05	0.998
Stationary Combustion - Other Fuel	CO_2	51.32	51.32	64.88	64.88	0.000	0.05	0.999
CH_4 Emission from Rice Cultivation	CH_4	50.54	50.54	11.19	11.19	0.000	0.05	0.999
Conversion to Grassland	CO_2	0.00	0.00	-19.80	19.80	0.000	0.04	1.000
CH_4 Emission from Industry	CH_4	7.84	7.84	14.56	14.56	0.000	0.02	1.000

Table A1-5. *Key Categories with LULUCF, Tier 1 Trend Assessment*

IPCC Categories	Direct Greenhouse Gas	Base Years (1985-87) Emission (Gg CO_2 eq.)	Base Years (1985-87) Emission – Abs. Value (Gg CO_2 eq.)	Current Year (2005) Emission (Gg CO_2 eq.)	Current Year (2005) Emission – Abs. Value (Gg CO_2 eq.)	Trend Assess-ment	Contribu-tion to Trend %	Cumula-tive Total
Mobile Combustion	CH_4	45.35	45.35	28.22	28.22	0.000	0.01	1.000
Forest Land Remaining Forest Land	CH_4	30.03	30.03	26.88	26.88	0.000	0.01	1.000
N_2O Emissions from Waste Incineration	N_2O	0.69	0.69	1.66	1.66	0.000	0.00	1.000
Forest Land Remaining Forest Land	N_2O	3.06	3.06	2.73	2.73	0.000	0.00	1.000
CO_2 Emissions from Nitric Acid Production	CO_2	0.08	0.08	0.08	0.08	0.000	0.00	1.000
Fugitive Emissions from Coal Mining and Handling	CO_2	3.60	3.60	0.00	0.00		0.00	1.000
Field Burning of Agricultural Residues	CH_4	45.51	45.51	0.00	0.00		0.00	1.000
Field Burning of Agricultural Residues	N_2O	13.34	13.34	0.00	0.00		0.00	1.000

Table A1-6. *Key Categories without LULUCF, Tier 2 Level Assessment*

IPCC Categories	Direct Greenhouse Gas	Base Years (1985-87) Emission (Gg CO_2 eq.)	Current Year (2005) Emission (Gg CO_2 eq.)	Activity Data Uncer-tainty	Emission Factor Uncer-tainty	Level Assess-ment with Uncertainty	Contribution to Total Uncertainty (%)	Cumulative Total (%)
Emissions from Wastewater Handling	**N_2O**	**207.70**	**210.80**	**10**	**1000**	**2.63**	**16.25**	**16.25**
Stationary Combustion - Gas	**CO_2**	**20,787.96**	**27,980.57**	**5**	**5**	**2.47**	**15.25**	**31.50**
Direct N_2O Emissions from Agricultural Soils	**N_2O**	**6,043.45**	**3,230.41**	**20**	**50**	**2.17**	**13.41**	**44.91**
Fugitive Emissions from Oil and Gas Operations (Main Source: Gas Distribution)	**CH_4**	**1,601.78**	**2,048.12**	**2**	**50**	**1.28**	**7.90**	**52.81**
Indirect N_2O Emissions from Nitrogen Used in Agriculture	**N_2O**	**4,425.50**	**2,011.70**	**5**	**50**	**1.26**	**7.79**	**60.60**
CH_4 Emissions from Solid Waste Disposal Sites	**CH4**	**1,917.30**	**2,858.10**	**10**	**30**	**1.13**	**6.97**	**67.57**
Mobile Combustion - Road	**CO_2**	**6,807.45**	**11,603.23**	**5**	**5**	**1.02**	**6.32**	**73.90**
Stationary Combustion - Coal	**CO_2**	**34,678.65**	**13,149.58**	**2**	**5**	**0.88**	**5.46**	**79.36**
Mobile Combustion	**N_2O**	**112.10**	**424.77**	**5**	**100**	**0.53**	**3.28**	**82.63**
CH_4 Emissions from Enteric Fermentation in Domestic Livestock	**CH_4**	**3,234.36**	**1,472.70**	**2**	**20**	**0.37**	**2.28**	**84.92**
Stationary Combustion - Oil	**CO_2**	**16,628.08**	**5,062.38**	**2**	**5**	**0.34**	**2.10**	**87.02**
Non-CO_2 Emission from Stationary Fuel Combustion	**N_2O**	**832.21**	**475.27**	**3**	**50**	**0.30**	**1.84**	**88.85**
N_2O Emissions from Manure Management	**N_2O**	**2,402.54**	**1,127.39**	**2**	**20**	**0.28**	**1.75**	**90.60**
Emissions from Wastewater Handling	CH_4	847.03	574.02	20	30	0.26	1.60	92.19
N_2O Emission from Industry	N_2O	4,541.51	1,940.98	2	10	0.25	1.53	93.72
CO_2 Emission from Other Mineral Products	CO_2	529.48	338.33	10	50	0.22	1.33	95.05
Emissions from Substitutes for Ozone Depleting Substances	HFCs	1.74	517.58	10	20	0.14	0.89	95.94
Fugitive Emissions from Oil and Gas Operations	CO_2	195.68	84.92	100	80	0.14	0.84	96.78
CH_4 Emissions from Manure Management	CH_4	889.57	410.17	2	20	0.10	0.64	97.42
Non-biogenic CO_2 from Waste	CO_2	97.62	297.23	10	20	0.08	0.51	97.93
Animal Production	N_2O	390.92	200.91	2	20	0.05	0.31	98.24

Table A1-6. *Key Categories without LULUCF, Tier 2 Level Assessment*

IPCC Categories	Direct Greenhouse Gas	Base Years (1985-87) Emission (Gg CO_2 eq.)	Current Year (2005) Emission (Gg CO_2 eq.)	Activity Data Uncer-tainty	Emission Factor Uncer-tainty	Level Assess-ment with Uncertainty	Contribution to Total Uncertainty (%)	Cumulative Total (%)
CO_2 Emissions from Cement Production	CO_2	1,765.31	1,198.75	2	2	0.04	0.26	98.50
Non-CO_2 Emission from Stationary Fuel Combustion	CH_4	576.91	337.70	3	8	0.04	0.22	98.72
Mobile Combustion - Other	CO_2	762.19	173.34	5	15	0.03	0.21	98.93
CO_2 Emissions from Ammonia Processes	CO_2	1,995.97	822.38	2	2	0.03	0.18	99.11
SF6 Emissions from Electrical Equipment	SF_6	70.15	201.02	10	2	0.03	0.16	99.27
CO_2 Emissions from Lime Production	CO_2	645.03	323.14	5	2	0.02	0.13	99.41
CO_2 Emissions from Metal Production	CO_2	641.57	310.72	2	5	0.02	0.13	99.54
CO_2 Emission from Solvent and Other Product Use	CO_2	130.68	65.49	10	20	0.02	0.11	99.65
Mobile Combustion	CH_4	45.35	28.22	5	50	0.02	0.11	99.76
CO_2 Emission from Limestone and Dolomit Use	CO_2	248.68	332.49	2	1	0.01	0.06	99.81
Stationary Combustion - Other Fuel	CO_2	51.32	64.88	5	10	0.01	0.06	99.87
PFCs Emissions	PFCs	166.82	209.39	1	2	0.01	0.04	99.91
CH_4 Emission from Rice Cultivation	CH_4	50.54	11.19	2	30	0.00	0.03	99.93
CH_4 Emission from Industry	CH_4	7.84	14.56	1	20	0.00	0.02	99.96
Fugitive Emissions from Coal Mining and Handling	CH_4	923.02	21.92	3	10	0.00	0.02	99.97
N_2O Emission from Solvent and Other Product Use	N_2O	253.77	82.75	2	1	0.00	0.01	99.99
N_2O Emissions from Waste Incineration	N_2O	0.69	1.66	5	100	0.00	0.01	100.00
CO_2 Emissions from Nitric Acid Production	CO_2	0.08	0.08	2	2	0.00	0.00	100.00
Fugitive Emissions from Coal Mining and Handling	CO_2	3.60	0.00	3	10	0.00	0.00	100.00
Field Burning of Agricultural Residues	CH_4	45.51	0.00	10	100	0.00	0.00	100.00
Field Burning of Agricultural Residues	N_2O	13.34	0.00	10	200	0.00	0.00	100.00

Table A1-7. *Key Categories without LULUCF, Tier 2 Trend Assessment*

IPCC Categories	Direct Greenhouse Gas	Base Years (1985-87) Emission (Gg CO_2 eq.)	Current Year (2005) Emission (Gg CO_2 eq.)	Activity Data Uncer-tainty	Emission Factor Uncer-tainty	Trend Assess-ment with Uncertainty	Contribution to Total Uncertainty (%)	Cumulative Total (%)
Stationary Combustion - Gas	**CO_2**	**20787.96**	**27980.57**	**5**	**5**	**1.72**	**15.10**	**15.10**
Emissions from Wastewater Handling	**N_2O**	**207.70**	**210.80**	**10**	**1000**	**1.20**	**10.50**	**25.60**
Stationary Combustion - Coal	**CO_2**	**34678.65**	**13149.58**	**2**	**5**	**1.06**	**9.27**	**34.87**
Indirect N_2O Emissions from Nitrogen Used in Agriculture	**N_2O**	**4425.50**	**2011.70**	**5**	**50**	**0.96**	**8.39**	**43.26**
Direct N_2O Emissions from Agricultural Soils	**N_2O**	**6043.45**	**3230.41**	**20**	**50**	**0.93**	**8.18**	**51.45**
Mobile Combustion - Road	**CO_2**	**6807.45**	**11603.23**	**5**	**5**	**0.87**	**7.66**	**59.11**
CH_4 Emissions from Solid Waste Disposal Sites	**CH_4**	**1917.30**	**2858.10**	**10**	**30**	**0.87**	**7.61**	**66.72**
Fugitive Emissions from Oil and Gas Operations (Main Source: Gas Distribution)	**CH_4**	**1601.78**	**2048.12**	**2**	**50**	**0.84**	**7.38**	**74.10**
Stationary Combustion - Oil	**CO_2**	**16628.08**	**5062.38**	**2**	**5**	**0.63**	**5.50**	**79.60**
Mobile Combustion	**N_2O**	**112.10**	**424.77**	**5**	**100**	**0.62**	**5.47**	**85.07**
CH_4 Emissions from Enteric Fermentation in Domestic Livestock	**CH_4**	**3234.36**	**1472.70**	**2**	**20**	**0.28**	**2.45**	**87.52**
N_2O Emission from Industry	**N_2O**	**4541.51**	**1940.98**	**2**	**10**	**0.22**	**1.95**	**89.47**
Emissions from Substitutes for Ozone Depleting Substances	**HFCs**	**1.74**	**517.58**	**10**	**20**	**0.21**	**1.82**	**91.29**
N_2O Emissions from Manure Management	N_2O	2402.54	1127.39	2	20	0.20	1.71	93.00
Fugitive Emissions from Oil and Gas Operations	CO_2	195.68	84.92	100	80	0.12	1.03	94.03
Fugitive Emissions from Coal Mining and Handling	CH_4	923.02	21.92	3	10	0.12	1.02	95.04
Mobile Combustion - Other	CO_2	762.19	173.34	5	15	0.10	0.89	95.93
Non-biogenic CO_2 from Waste	CO_2	97.62	297.23	10	20	0.09	0.81	96.74
Non-CO_2 Emission from Stationary Fuel Combustion	N_2O	832.21	475.27	3	50	0.09	0.81	97.55
CH_4 Emissions from Manure Management	CH_4	889.57	410.17	2	20	0.07	0.66	98.20
CO_2 Emissions from Ammonia Processes	CO_2	1995.97	822.38	2	2	0.03	0.25	98.45

Table A1-7. *Key Categories without LULUCF, Tier 2 Trend Assessment*

IPCC Categories	Direct Greenhouse Gas	Base Years (1985-87) Emission (Gg CO_2 eq.)	Current Year (2005) Emission (Gg CO_2 eq.)	Activity Data Uncer-tainty	Emission Factor Uncer-tainty	Trend Assess-ment with Uncertainty	Contribution to Total Uncertainty (%)	Cumulative Total (%)
SF_6 Emissions from Electrical Equipment	SF_6	70.15	201.02	10	2	0.03	0.24	98.70
CO_2 Emission from Other Mineral Products	CO_2	529.48	338.33	10	50	0.03	0.23	98.93
Animal Production	N_2O	390.92	200.91	2	20	0.03	0.22	99.16
CO_2 Emissions from Metal Production	CO_2	641.57	310.72	2	5	0.01	0.11	99.27
CH_4 Emission from Rice Cultivation	CH_4	50.54	11.19	2	30	0.01	0.11	99.38
CO_2 Emissions from Lime Production	CO_2	645.03	323.14	5	2	0.01	0.11	99.49
CO_2 Emission from Solvent and Other Product Use	CO_2	130.68	65.49	10	20	0.01	0.09	99.58
Non-CO_2 Emission from Stationary Fuel Combustion	CH_4	576.91	337.70	3	8	0.01	0.08	99.66
Emissions from Wastewater Handling	CH_4	847.03	574.02	20	30	0.01	0.08	99.74
CO_2 Emission from Limestone and Dolomit Use	CO_2	248.68	332.49	2	1	0.01	0.06	99.80
Stationary Combustion - Other Fuel	CO_2	51.32	64.88	5	10	0.01	0.05	99.85
PFCs Emissions	PFCs	166.82	209.39	1	2	0.00	0.03	99.88
N_2O Emission from Solvent and Other Product Use	N_2O	253.77	82.75	2	1	0.00	0.03	99.92
CH_4 Emission from Industry	CH_4	7.84	14.56	1	20	0.00	0.03	99.94
Mobile Combustion	CH_4	45.35	28.22	5	50	0.00	0.03	99.97
N_2O Emissions from Waste Incineration	N_2O	0.69	1.66	5	100	0.00	0.02	99.99
CO_2 Emissions from Cement Production	CO_2	1765.31	1198.75	2	2	0.00	0.01	100.00
CO_2 Emissions from Nitric Acid Production	CO_2	0.08	0.08	2	2	0.00	0.00	100.00
Fugitive Emissions from Coal Mining and Handling	CO_2	3.60	0.00	3	10	0.00	0.00	100.00
Field Burning of Agricultural Residues	CH_4	45.51	0.00	10	100	0.00	0.00	100.00
Field Burning of Agricultural Residues	N_2O	13.34	0.00	10	200	0.00	0.00	100.00

A1.4. Summary assessment

Table A1-8. *Key category analysis summary – without LULUCF*

KEY CATEGORY ANALYSIS SUMMARY – WITHOUT LULUCF				
Quantitative Method Used: [X] **Tier 1** [X] **Tier 2**				
A	**B**	**C**	**D**	**E**
IPCC Source Categories	**Direct Greenhouse Gas**	**Key Source Category Flag (Yes or No)**	**If C Yes. Criteria for Identification**	**Comments**
1. Energy				
Stationary Combustion - Gas	CO_2	Yes	Level 1, Trend 1 Level 2, Trend 2	
Stationary Combustion - Coal	CO_2	Yes	Level 1, Trend 1 Level 2, Trend2	
Stationary Combustion - Oil	CO_2	Yes	Level 1, Trend 1 Level 2, Trend 2	
Non-CO_2 Emissions from Stationary Fuel Combustion	N_2O	Yes	Level 1 Level 2	
Non-CO_2 Emissions from Fuel Combustion	CH_4	No		
Stationary Combustion - Other Fuel	CO_2	No		
Mobile Combustion	N_2O	Yes	Level 1 Level 2, Trend 2	
Mobile Combustion - Other	CO_2	No		
Mobile Combustion	CH_4	No		
Mobile Combustion - Road	CO_2	Yes	Level 1, Trend 1 Level 2, Trend 2	
Fugitive Emissions from Coal Mining and Handling	CO_2	No		
Fugitive Emissions from Coal Mining and Handling	CH_4	Yes	Trend 1	
Fugitive Emissions from Oil and Gas Operations	CO_2	No		
Fugitive Emissions from Oil and Gas Operations	CH_4	Yes	Level 1, Trend 1 Level 2, Trend 2	Main Source: Gas Distribution
2. Industrial Processes				
N_2O Emission from Industry	N_2O	Yes	Level 1, Trend 1 Trend 2	
CH_4 Emission from Industry	CH_4	No		
CO_2 Emissions from Cement Production	CO_2	Yes	Level 1	
CO_2 Emissions from Lime Production	CO_2	No		
CO_2 Emission from Limestone and Dolomit Use	CO_2	No		
CO_2 Emission from Other Mineral Products	CO_2	No		
CO_2 Emissions from Ammonia Processes	CO_2	Yes	Level 1, Trend 1	
CO_2 Emissions from Metal Production	CO_2	No		

Table A1-8. *Key category analysis summary – without LULUCF*

KEY CATEGORY ANALYSIS SUMMARY – WITHOUT LULUCF				
Quantitative Method Used: [X] **Tier 1** [X] **Tier 2**				
A	**B**	**C**	**D**	**E**
IPCC Source Categories	**Direct Greenhouse Gas**	**Key Source Category Flag (Yes or No)**	**If C Yes. Criteria for Identification**	**Comments**
2. Industrial Processes				
PFCs Emissions	PFCs	No		
Emissions from Substitutes for Ozone Depleting Substances	HFCs	Yes	Level 1, Trend 1 Trend 2	
SF_6 Emissions from Electrical Equipment	SF_6	No		
3. Solvent and Other Product Use				
CO_2 Emission from Solvent and Other Product Use	CO_2	No		
N_2O Emission from Solvent and Other Product Use	N_2O	No		
4. Agriculture				
CH_4 Emissions from Enteric Fermentation in Domestic	CH_4	Yes	Level 1, Trend 1 Level 2, Trend 2	
CH_4 Emissions from Manure Management	CH_4	No		
N_2O Emissions from Manure Management	N_2O	Yes	Level 1, Trend 1 Level 2	
CH_4 Emission from Rice Cultivation	CH_4	No		
Direct N_2O Emissions from Agricultural Soils	N_2O	Yes	Level 1, Trend 1 Level 2, Trend 2	
Animal Production	N_2O	No		
Indirect N_2O Emissions from Nitrogen Used in Agriculture	N_2O	Yes	Level 1, Trend 1 Level 2, Trend 2	
Field Burning of Agricultural Residues	CH_4	No		
Field Burning of Agricultural Residues	N_2O	No		
6. Waste				
CH_4 Emissions from Solid Waste Disposal Sites	CH_4	Yes	Level 1, Trend 1 Level 2, Trend 2	
Emissions from Wastewater Handling	CH_4	Yes	Level 1	
Emissions from Wastewater Handling	N_2O	Yes	Level 2, Trend 2	
Non-biogenic CO_2 from Waste	CO_2	No		
N_2O Emissions from Waste Incineration	N_2O	No		

Table A1-9. *Key category analysis summary – with LULUCF*

SOURCE CATEGORY ANALYSIS SUMMARY – WITH LULUCF				
Quantitative Method Used: ☒ **Tier 1** ☐ **Tier 2**				
A	**B**	**C**	**D**	**E**
IPCC Source Categories	**Direct Greenhouse Gas**	**Key Source Category Flag (Yes or No)**	**If C Yes. Criteria for Identification**	**Comments**
1. Energy				
Stationary Combustion - Gas	CO_2	Yes	Level 1, Trend 1	
Stationary Combustion - Coal	CO_2	Yes	Level 1, Trend 1	
Stationary Combustion - Oil	CO_2	Yes	Level 1, Trend 1	
Non-CO_2 Emissions from Stationary Fuel Combustion	N_2O	Yes	Level 1	
Non-CO_2 Emissions from Fuel Combustion	CH_4	No		
Stationary Combustion - Other Fuel	CO_2	No		
Mobile Combustion	N_2O	No		
Mobile Combustion - Other	CO_2	Yes	Trend 1	
Mobile Combustion	CH_4	No		
Mobile Combustion - Road	CO_2	Yes	Level 1, Trend 1	
Fugitive Emissions from Coal Mining and Handling	CO_2	No		
Fugitive Emissions from Coal Mining and Handling	CH_4	Yes	Trend 1	
Fugitive Emissions from Oil and Gas Operations	CO_2	No		
Fugitive Emissions from Oil and Gas Operations	CH_4	Yes	Level 1, Trend 1	Main Source: Gas Distribution
2. Industrial Processes				
N_2O Emission from Industry	N_2O	Yes	Level 1, Trend 1	
CH_4 Emission from Industry	CH_4	No		
CO_2 Emissions from Cement Production	CO_2	Yes	Level 1	
CO_2 Emissions from Lime Production	CO_2	No		
CO_2 Emission from Limestone and Dolomit Use	CO_2	No		
CO_2 Emission from Other Mineral Products	CO_2	No		
CO_2 Emissions from Ammonia Processes	CO_2	Yes	Level 1, Trend 1	
CO_2 Emissions from Metal Production	CO_2	No		
PFCs Emissions	PFCs	No		

Table A1-9. *Key category analysis summary – with LULUCF*

SOURCE CATEGORY ANALYSIS SUMMARY – WITH LULUCF				
Quantitative Method Used: ☒ **Tier 1** ☐ **Tier 2**				
A	**B**	**C**	**D**	**E**
IPCC Source Categories	**Direct Greenhouse Gas**	**Key Source Category Flag (Yes or No)**	**If C Yes. Criteria for Identification**	**Comments**
2. Industrial Processes				
Emissions from Substitutes for Ozone Depleting Substances	HFCs	Yes	Level 1, Trend 1	
SF_6 Emissions from Electrical Equipment	SF_6	No		
3. Solvent and Other Product Use				
CO_2 Emission from Solvent and Other Product Use	CO_2	No		
N_2O Emission from Solvent and Other Product Use	N_2O	No		
4. Agriculture				
CH_4 Emissions from Enteric Fermentation in Domestic	CH_4	Yes	Level 1, Trend 1	
CH_4 Emissions from Manure Management	CH_4	No		
N_2O Emissions from Manure Management	N_2O	Yes	Level 1, Trend 1	
CH_4 Emission from Rice Cultivation	CH_4	No		
Direct N_2O Emissions from Agricultural Soils	N_2O	Yes	Level 1, Trend 1	
Animal Production	N_2O	No		
Indirect N_2O Emissions from Nitrogen Used in Agriculture	N_2O	Yes	Level 1, Trend 1	
Field Burning of Agricultural Residues	CH_4	No		
N_2O Emissions from Agricultural Residue Buming	N_2O	No		
5. Land Use. Land-Use Change and Forestry				
Forest Land Remaining Forest Land	CO_2	Yes	Level 1, Trend 1	
Forest Land Remaining Forest Land	CH_4	No		
Forest Land Remaining Forest Land	N_2O	No		
Conversion to Forest Land	CO_2	Yes	Level 1	
Croplands Remaining Croplands and Emission from Lime	CO_2	No		
Conversion to Grassland	CO_2	No		
Conversion to Other Land	CO_2	Yes	Level 1, Trend 1	
6. Waste				
CH_4 Emissions from Solid Waste Disposal Sites	CH_4	Yes	Level 1, Trend 1	

Table A1-9. *Key category analysis summary – with LULUCF*

SOURCE CATEGORY ANALYSIS SUMMARY – WITH LULUCF				
Quantitative Method Used: ☒ **Tier 1** ☐ **Tier 2**				
A	**B**	**C**	**D**	**E**
IPCC Source Categories	**Direct Greenhouse Gas**	**Key Source Category Flag (Yes or No)**	**If C Yes. Criteria for Identification**	**Comments**
6. Waste				
Emissions from Wastewater Handling	CH_4	Yes	Level 1	
Emissions from Wastewater Handling	N_2O	No		
Non-biogenic CO_2 from Waste	CO_2	No		
N_2O Emissions from Waste Incineration	N_2O	No		

A1.5. References

Intergovernmental Panel on Climate Change (IPCC), 2000: Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories. *Intergovernmental Panel on Climate Change National Greenhouse Gas Inventories Programme*. Institute for Global Environmental Strategies, Japan.
Available online at: http://www.ipcc-nggip.iges.or.jp/public/gp/english/

Intergovernmental Panel on Climate Change (IPCC), 2003: Good practice guidance for Land Use, Land Use Change and Forestry. *Intergovernmental Panel on Climate Change National Greenhouse Gas Inventories Programme*. Institute for Global Environmental Strategies, Japan.
Available online at: http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm

Annex 2 Detailed discussion of methodology and data for estimating CO_2 emissions from fossil fuel combustion

A2.1. Fuel Consumption Data

The GHG emission calculations of fossil fuel combustion are based on the Hungarian energy balance prepared by Energia Központ Kht. The summary table of the energy balance for 2005 can be seen in *Table A2-4*.

Energia Központ Kht. collects fuel consumption data from users and prepares the energy balance and other statistics. Independent experts check the raw data of the energy balance and they compare them with energy consumption data from other sources (e.g. data from MVM Rt.). After the quality check the Energy Statistics is published.

A2.2. EU-ETS Data

In January 2005 the European Union Greenhouse Gas Emission Trading Scheme (EU ETS) commenced operation as the largest multi-country, multi-sector Greenhouse Gas emission trading scheme world-wide. The scheme is based on Directive 2003/87/EC, which entered into force on 25 October 2003 in the EU. This law came into force in the Hungarian legal system in 2005 (2005/XV.).

A2.3. Source of the Country Specific Emission Factors

The law 2005/XV. appoints which installation have to join in the EU ETS. It is required, for establishments that emit more than 500 kt CO_2/year, to measure the calorific value, the carbon content and oxidation factor of used coal in accredited laboratory. These installations can calculate their emission according to the measurement data. Evaluating the measurements it is possible to define new emission factors that suit better to the Hungarian conditions. Instead of IPCC default emission factors we can calculate the national emissions using more appropriate values.

The Hungarian coal terminology differs slightly from that of IPCC. The partitioning is created according to the age of coal; *Table A2-1*. shows the classification according to the Hungarian and IPCC (2006) categories.

Hungarian Terminology	Net Calorific Values	IPCC Category (Gross calorific value)
Hard Coal	17-33 MJ/kg	Other Bituminous Coal (>23.865 MJ/kg)
Hard Coal	17-33 MJ/kg	Sub-Bituminous Coal (17.435 MJ/kg -23.865 MJ/kg)
Brown Coal	10-17 MJ/kg	Lignite (<17.435 MJ/kg)
Lignite (young brown coal)	3.5-10 MJ/kg	Lignite (<17.435 MJ/kg)

Table A2-1. *Comparison of Hungarian and IPCC terminology for coal (Sources: Bihari, 1998; IPCC, 2006)*

A2.3.1. Lignite

Fott (1999) published his research about the emission factors for the European coal (especially for Czech coal). It was found that carbon emission factor of coals and lignite are dependent especially on the net calorific value. For brown coal-lignite with the lowest net calorific values (lower than 12 MJ/kg) the default (IPCC, 1997) value 27.6 t C/TJ (101.2 t CO_2/TJ) seems to be too small.

According to the 15 months long measurements of the leading Hungarian lignite user, the mean net calorific value is 6.78 MJ/kg and the CO_2 emission factor is 113.2 t CO_2/TJ (30.87 t C/TJ) based on the carbon content of the lignite.

A2.3.2. Brown Coal

Table A2-2 shows the measured net calorific values (NCV) and emission factors for brown coal used in Hungary.

Brown coal type	Measured net calorific value (MJ/kg)	Measured emission factor (t CO_2/TJ)
Hungarian	12.13	99.46
Lencsehegyi (Hungarian)	14.61	101.90
Import (Czech)	15.53	101.10
Import (other I.)	16.62	100.6
Import (other II.)	18.67	97.36
Import (Russian I.)	18.95	100.68

Table A2-2. *Measured net calorific values and emission factors for brown coal used in Hungary*

It can be seen that the default emission factor for lignite (101.2 t CO_2/TJ or 27.56 t C/TJ) is more suitable for this kind of coal, although the recommended value is 96.07 t CO_2/TJ for Sub-Bituminous Coal (GCV>17.435 MJ/kg).

A2.3.3. Hard Coal

The mining of coking hard coal ceased around 1990, since then only imported hard coal have been used in small amount. *Table A2-3.* summarizes the measured calorific values and emission factors for imported hard coals.

Hard coal type	Measured net calorific value (MJ/kg)	Measured emission factor (t CO_2/TJ)
Import (other)	22.05	95.85
Import (Russian I.)	23.60	94.84
Import (Russian II.)	23.80	94.15
Import (Polish I.)	24.98	109.40
Import (Polish II.)	25.94	95.22

Table A2-3. *Measured net calorific values and emission factors for hard coal used in Hungary*

The IPCC Guidelines suggest the 25.8 t C/TJ (94.6 t CO_2/TJ) emission factor for coals having gross calorific value more than 23.865 MJ/kg (other bituminous coal). Considering the measured data (the value of 109.4 is presumably incorrect) the emission factor for this type of coal should be 95.2 t CO_2/TJ (25.96 t C/TJ) in Hungary, instead of the default value.

A2.3.4. Summary

Although the use of hard coal (other bituminous coal) is rare, all of the non-lignite type of coals (excluding coking coal) are counted as other bituminous coal in the inventory, with a mean emission factor of 99 t CO_2/TJ (27 t C/TJ). The Hungarian lignite with the above mentioned emission factor and also brown coal with an emission factor of 113.2 t CO_2/TJ (30.87 t C/TJ) are taken into account as lignite.

A2.4. Reference approach

Energia Központ Kht. publishes Energy Statistics Yearbooks, which contain the used activity data (production, imports, exports, stock change, non-energy use) for each fuel type in summary tables (see *Table A2-4*), individual tables for time-series of each fuel type from 1985 until the previous year of publishing date (whole time-series can be seen only in the electronic format). Conversion factor was taken as 1.0 in all categories, because Energy Statistics Yearbook represents fuels in energy units (TJ), as well. Default emission factors were used in most cases. There are only two exceptions, namely, the category of lignite and other bituminous coal (see explanation above in *section A2.3*). Calculation and fraction of carbon oxidized are in accordance with Revised Guidelines (IPCC, 1997).

A2.5. References

Bihari, P., 1998: Energetics II. – university manuscript (In Hungarian: Energetika II., kézirat), *Budapesti Műszaki Egyetem*, Budapest.

Fott, P., 1999: Carbon emission factors of coal and lignite: analysis of Czech coal data and comparison to European values. *Environmental Science & Policy,* 2, 347-354.

Intergovernmental Panel on Climate Change (IPCC), 1997: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, *Intergovernmental Panel on Climate Change, Organisation for Economic Cooperation and Development, and International Energy Agency*. *(IPCC/OECD/IEA),* UK Meteorological Office, Bracknell.
Available online at: http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm

Intergovernmental Panel on Climate Change, 2006: 2006 IPCC Guidelines for National Greenhouse Gas Inventories. *Prepared by the National Greenhouse Gas Inventories Programme*, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). ISBN 4-88788-032-4, published: IGES, Japan.
Available online at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htm

Hungarian Energy Balance for 2005

Unit: TJ	Primary Energy Production	Import	From Stock Decreasing	From Transformation	Waste Energy	Total Source and Distribution	Domestic Consumption	Direct Consumption	Direct: Non-energy use	For Transformation	Exports	For Stock Increasing	Statistical Differences	Transformation Losses
PRIMARY ENERGY	**427 984**	**735 179**	**3 917**			**1 167 080**	**981 744**	**395 174**	**15 055**	**586 570**	**17 688**	**5 844**		
Coal	73 185	54 925	3 917			132 027	125 509	15 150		110 359	3 322	3 196		
Crude OIL	39 607	269 634	0			309 241	294 078	2 693		291 385	14 366	797		
Natural Gas	97 580	410 620	0			508 200	506 349	362 136	15 055	144 213	0	1 851		
NGL	10 246					10 246				*see LPG*				
Hydro Power	731					731				*see Electricity*				
Nuclear Power	150 791					150 791				*see Electricity*				
Prod.of Wind Power Plant	36					36				*see Electricity*				
Firewood	25 088					25 088	25 088	21 430		3 658				
Other Primary Energy	9 690					9 690	9 690	0		9 690				
Estimated Renewables Energy [1)]	18 267					18 267	18 267	-6 234		24 501				
Municipal Solid Waste	2 764					2 764	2 764	0		2 764				
SECONDARY ENERGY	**0**	**138 392**	**1 369**	**467 117**	**7 005**	**613 882**	**544 629**	**531 353**	**70 202**	**13 276**	**123 124**	**6 946**		
Briquette		300	0	645		945	925	913		12	0	20		
Ahydrated Lignite						0	0	0						
Coke		6 093	0	18 004		24 097	21 938	21 822		116	1 553	606		
Other Product from Coal Proc.				1 447		1 447	1 447	1 447	1 447					
LPG		10 105	0	3 848		13 953	16 867	16 867	5 203		7 097	235		
Gasoline		28 658	434	100 783		129 875	106 108	106 108	36 003		23 291	476		
Petroleum		3 107	156	11 129		14 392	9 369	9 369	0		5 023	0		
Gas / Diesel Oil		56 261	0	123 240		179 501	119 464	119 305	15 089	159	57 869	2 168		
Heavy Fuel Oil		4 937	492	16 567		21 997	19 457	14 004		5 453	2 236	304		
Bitumen		2 833	150	19 085		22 068	12 548	12 460	12 460	88	9 520	0		
Other Refinery Product		3 175	0	18 305		21 480	4 468	4 468			13 875	3 137		
Coke Oven Gas				4 107		4 107	4 107	1 582		2 525				
Blast Furnace Gas					7 005	7 005	7 005	2 942		4 063				
Heat energy				63 138		63 138	63 138	63 138						
Electricity				78 148		78 148	151 135	151 135						
Import Electricity		22 417				22 417				*see Electricity*				
Petroleum Coke		506	137	8 671		9 313	6 654	5 794		860	2 659	0		
TOTAL ENERGY	**427 984**	**873 571**	**5 286**	**467 117**	**7 005**	**1 780 962**	**1 526 373**	**926 527**	**85 257**	**599 846**	**140 812**	**12 790**	**100 988**	**132 729**
Unaccumulated Consumption	427 984	873 571	5 286			1 306 840	1 153 239							

1) incl. the estemated firewood, biomass and waste, geothermal, biogas, wind, solar, etc. energy

Source: Energia Központ Kht., 2007: Energy Statistics Yearbook, 2005 (In Hungarian: Energia Statisztika Évkönyv, 2005), Table 19/a and 19/b

Table A2-4. *Hungarian energy balance for 2005*

Annex 3 Other detailed methodological descriptions for individual source or sink categories

A3.1. Energy

CH_4 and N_2O emission calculation for road transport

The used method for emission estimation of road transport consist of the following steps:

1. Quantification of stock of each road vehicle type is based on data obtained from KSH and KTI. The categories are the following:
   - Gasoline:
     a. Passenger car, uncontrolled
     b. Passenger car, early oxidation catalyst
     c. Passenger car, 2-stroke engine
     d. Passenger car, three-way catalyst
     e. Motorcycles
     f. Light duty vehicle
     g. Light duty vehicle, catalyst
     h. Heavy duty vehicle
     i. Heavy duty vehicle, catalyst
     j. Bus
   - LPG
   - Natural Gas
   - Other fuel
   - Diesel
     a. Passenger car
     b. Light duty vehicle
     c. Heavy duty vehicle
     d. Bus
2. Identification of fuel consumption for 100 km of each category is based on dafault values from Revised Guidelines, 2006 IPCC Guidelines and official fuel consumption database.
3. Correction of fuel consumption of each vehicle type with real sharing in traffic is based on KTI reports.
4. Calculation of proportion in total annual fuel consumption for each category and fuel type. Total annual fuel consumption for each fuel type is given in the Energy Statistics Yearbook.
5. Calculation of total annual fuel consumption for each category and fuel type.
6. Calculation of total annual emission from category specific emission factors (see *Table 3.9 in Chapter 3.4*) and total annual fuel consumption for each category and fuel type .
7. Addition of emissions in each fuel type.

A3.2. Industry

Specific emission factors for aluminium production

According to the recommendations of the Revised Guidelines (IPCC, 1997) and the Good Practice Guidance (IPCC, 2000), the value of the specific emission factor was determined using a Tabereaux approximation as follows:

$$EF = Slope \cdot AEF \cdot AED \quad . \qquad \textit{Equation A3-1.}$$

where *EF* means the emission factor (kg/t). Slope is derived from

$$Slope = \begin{cases} 1.698 \cdot \frac{p}{CE} & \text{for } CF_4 \\ 0.1698 \cdot \frac{p}{CE} & \text{for } C_2F_6 \end{cases} \qquad \textit{Equation A3-2.}$$

According to the Revised Guidelines for the given technology *p=0.04* and *CE=0.91* were used as constants. In *Equation A3-1*. *AEF* means the effect number, *AED* is the effect time. On the basis of factory data, the value of AEF is between 0.8 to 2.8 pcs/pot-day and the value of AED is 4 minutes. Information on the pot types, effect number and effect time were supplied by the factories. Currently, only vertical-stud pots are used in Hungary, although horizontal-stud pots were also present in the beginning of the period. *Table A3-1* shows the calculated specific emission factors.

Year	Emission factor (kg/t)
1985	0.4857
1986	0.4912
1987	0.4951
1988	0.4758
1989	0.5110
1990	0.4858
1991	0.5010
1992	0.6777
1993	0.7046
1994	0.7225
1995	0.7046
1996	0.6419
1997	0.6359
1998	0.6837
1999	0.7016
2000	0.8389
2001	0.7732
2002	0.7703
2003	0.7243
2004	0.7849
2005	0.8813

Table A3-1. *Specific emission factors for aluminium production*

A3.3. Solvent and Other Product Use

Carbon and NMVOC ratio of solvents

The Revised Guidelines (IPCC, 1997) provide little help for calculation of specific emission factor for solvents. Compositions and solvent contents were previously coordinated with the Paint Industry. Due to these discussions, paints, lacquers, kits etc. were classified into several groups according to the mean solvent content and NMVOC emissions were taken to be equal to the amount of solvent.

On the basis of solvent composition, the mean carbon content of each category was determined using the method described in the following exemplary calculation.

"Usual" solvent composition of solvent based paints: 48 % white spirit, 40% xylene, 12 % esters. In accordance with the empirical formula of chemical substance, the carbon content can be calculated. E.g., the empirical formula of xylene is C_8H_{10}. From this, the carbon content is 90.5 % w/w. Similarly, carbon contents were obtained by calculating the other components and their carbon contents, and weighting it according to the solvent composition. These are shown in the second column of *Table A3-2*.

	Carbon content (%)	Solvent content (%)
Solvent based paints	81.4	50
Water based paints	57.0	6-8
Other paints, lacquers etc.	80.0	25
Glues etc.	57.0	8
Solvents	81.6	100

Table A3-2. *Solvent and carbon contents of paints, lacquers, glues etc.*

By this, the amount of carbon (C) from NMVOC (for each type of paint) and, upon multiplying it by 44/12, the amount of CO_2 may be calculated. In *Table A3-3* the mean carbon and NMVOC ratios are shown for the last 6 years. The decreasing numbers indicate the increasing proportion of water based paints. However, the proportion of water based paints has continued to increase in 2005, this C/NMVOC ratio has increased due to decreasing amount of the group of glues, which has changed the previous ratio of solvents' composition.

Year	C/NMVOC
2000	0.7766
2001	0.7750
2002	0.7682
2003	0.7593
2004	0.7415
2005	0.7650

Table A3-3. *Mean carbon and NMVOC ratio of solvents for the last 6 years*

A3.4. Agriculture

Annual average number of livestock populations

Since 2000, KSH has been registering the livestock three times a year (1 April, 1 August, 1 December) using a method which is equal to that of the EU (97/77/EC, 1997). In accordance with the recommendations of KSH, annual average numbers in the given livestock category were calculated using the following equation:

$$N_{2005} = \frac{0.5 \cdot N_{Dec\ 2004} + N_{Apr\ 2005} + N_{Aug\ 2005} + 0.5 \cdot N_{Dec\ 2005}}{3}. \quad \textit{Equation A3-3.}$$

where N_{2005} is the annual average number of animals in 2005, $N_{Dec\ 2004}$ is the number of animals registered on 1 December 2004, $N_{Apr\ 2005}$ is the number of animals registered on 1 April 2005, $N_{Aug\ 2005}$ is the number of animals registered on 1 August 2005, $N_{Dec\ 2005}$ is the number of animals registered on 1 December 2005. Numbers are expressed in 1000 pieces.

A3.5. References

Council Directive 97/77/EC of 16 December 1997 amending Directives 93/23/EEC. 93/24/EEC and 93/25/EEC on the statistical surveys to be carried out on pig. bovine animal and sheep and goat production.

Intergovernmental Panel on Climate Change (IPCC), 1997: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. *Intergovernmental Panel on Climate Change. Organisation for Economic Cooperation and Development. and International Energy Agency. (IPCC/OECD/IEA).* UK Meteorological Office, Bracknell.
Available online at: http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm

Intergovernmental Panel on Climate Change (IPCC), 2000: Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories. *Intergovernmental Panel on Climate Change National Greenhouse Gas Inventories Programme*. Institute for Global Environmental Strategies, Japan.
Available online at: http://www.ipcc-nggip.iges.or.jp/public/gp/english/

Annex 4 Comparison of Sectoral and Reference Approaches

Analysis in case of total fuel consumption and total CO_2 emissions

The UNFCCC reference approach was compared with the sectoral approach as a check of combustion-related emissions. The check was performed for all years from 1985 to 2005 and is an integral part of reporting to the UNFCCC. The analysis includes also the comparison from the base year (1985-87).

The reference approach, in theory, includes all CO_2 emissions from all fossil fuel uses in a country and should be compared with a set of emissions from the sectoral approach that includes all CO_2 emissions from energy and non-energy (including feedstock) use of fossil fuels. In the CRF reporting software, the reference approach is directly compared with the sectoral fuel combustion total.

This direct comparison of the energy outputs from the reference approach and the sectoral approach used in the Common Reporting Format (CRF) shows a reference approach total that is consistently larger than the sectoral approach total (*Figure A4-1.*).

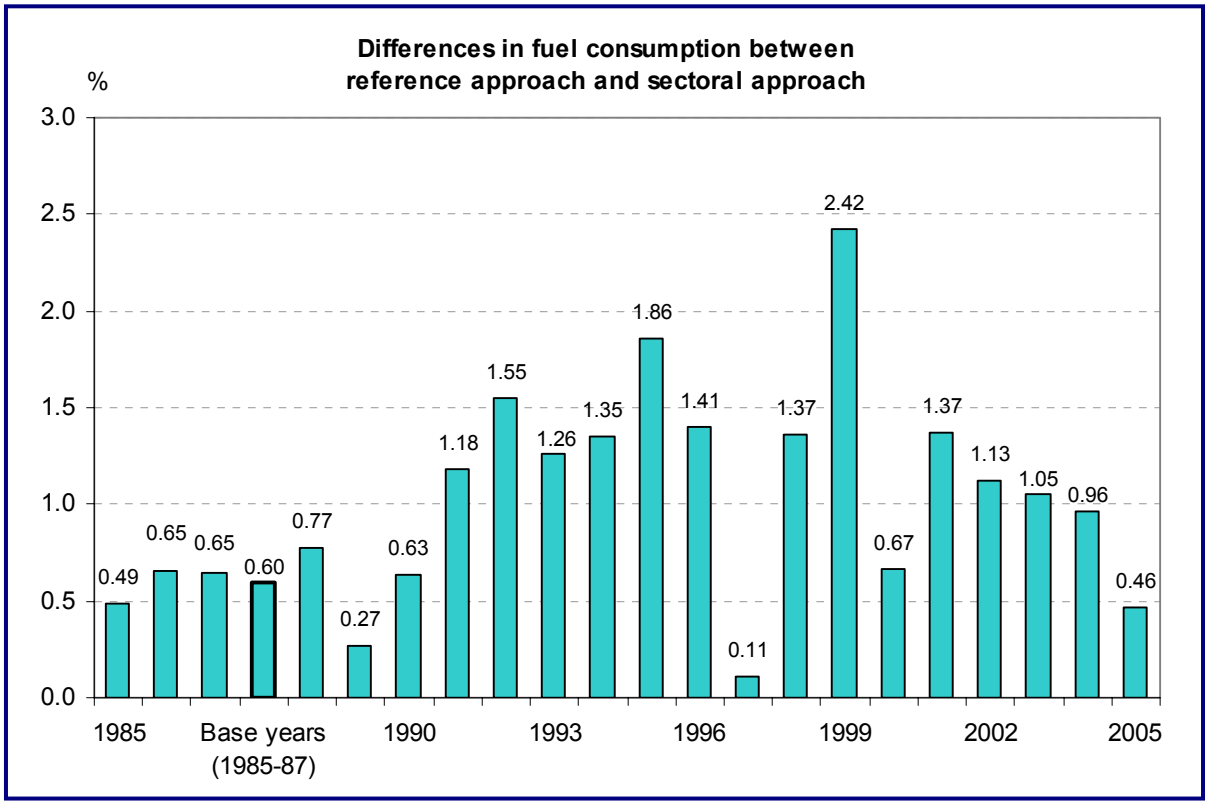

Figure A4-1. *Comparison of sectoral and reference approach – fuel consumption*

In 2005, comparing the two approaches the difference was 0.46% in energy consumption (*Figure A4-1.*) and -0.08% as regards CO_2 emission (*Figure A4-2.*). These differences characterize the previous years, too. The range of differences are between +0.11% (1997) and +2.42% (1999) with a 1.01% mean value as regards the fuel consumptions, and -0.70%

(1997) and 2.29%(1999) with a 0.69% mean value as regards the CO_2 emissions. The differences are less than 2% - except one year (1999). Due to the negligibility of the difference, no further corrections were necessary.

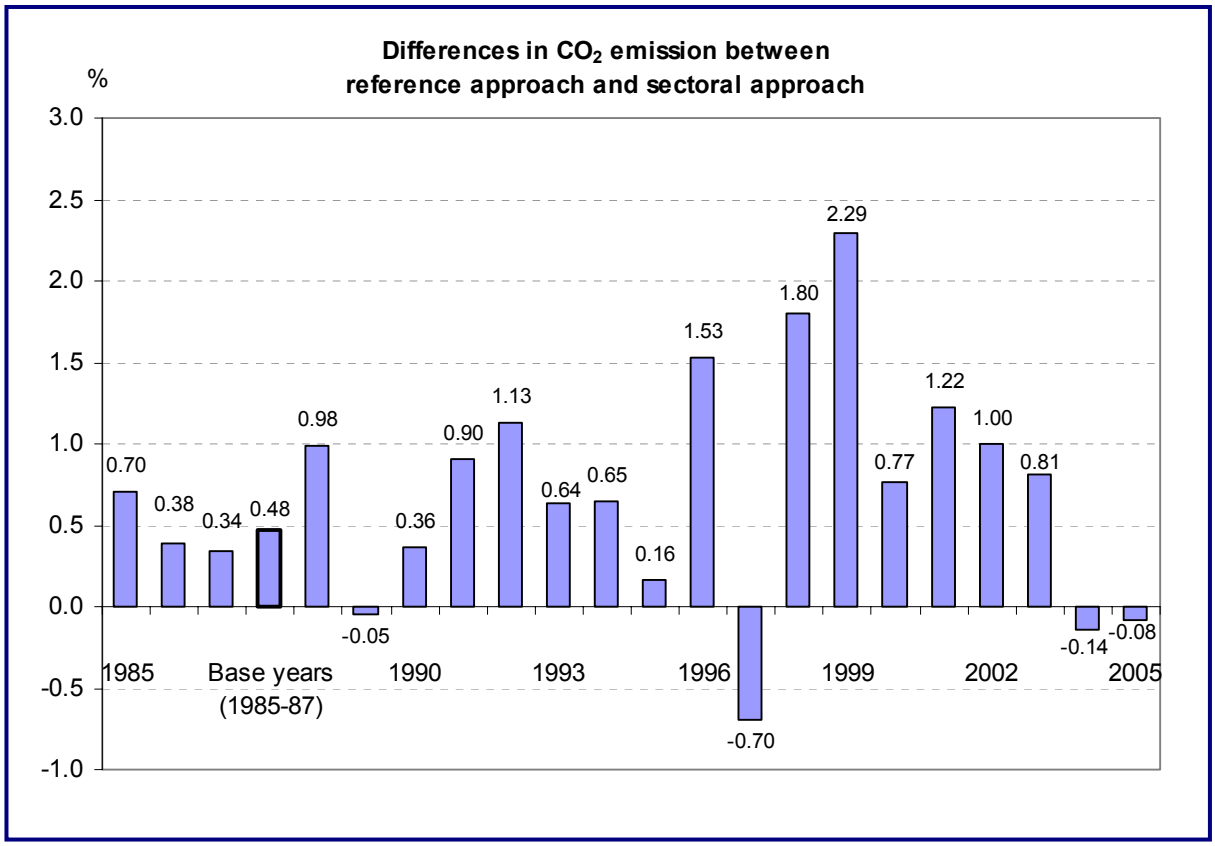

Figure A4-2. *Comparison of sectoral and reference approach – CO_2 emission*

It should be noted, that in case of liqiud fuels certain oil derivatives are calculated under the "other" category in sectoral approach. Therefore, to ensure the correctness of the calculations, these values should be added to the liquid item.

Annex 5 Assessment of completeness

To date, no detailed information is available on assessment of completeness and of potentially excluded sources and sinks of greenhouse gas emissions.

Annex 6 Quality Assurance and Quality Control

QA/QC activities are explained in Chapter 1.6. The following registers are used for documenting data sources, calculation methods, reason and effect of recalculations etc.

Documentation for the National Inventory Report/ Módszertan	
Validity/Érvényesség	
IPCC Sector	
IPCC category code	
Data and sources/ Adatok és források	
Input data (activity data, conversion factors, etc.)/ Bemenő adatok	
Uncertainties (upper and lower) associated with activity data/Bizonytalanság	
Source of input data/Adatforrás	
Type of emission factor	
Uncertainties (upper and lower) associated with emission factor/Bizonytalanság	
Used method/Alkalmazott eljárás	
Type of method /A módszer típusa	
Source or description of method/A módszer leírása	
Documented by/Készítette	
Name/Név	
Signature/Aláírás	
Date/Dátum	Budapest,

Recalculation/Újraszámolás	
Validity/Érvényesség	
IPCC Sector	
IPCC category	
Reasons for recalculations/Az újraszámolás okai	
Description of the new method/ Az új módszer leírása	
Alternative recalculation techniques can be applied/ Alternatív újrakalkulációs technika alkalmazható	***igen/yes*** ☐ ***nem/no*** ☐
Comparison of the methods/A régi és az új módszer összehasonlítása	
Documented by/Készítette	
Name/Név	
Signature/Aláírás	
Date/Dátum	Budapest,

Figure A6-1. *Register of used data, data sources and calculation methods and register of recalculations*

Errata/ Hibajegyzék Quality Control	
Inventory year	
IPCC Sector or other	
List of errata	
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
Documented by/Készítette	
Name/Név	
Signature/Aláírás	
Date/Dátum	Budapest,

Justification/Indoklás Quality Control	
Inventory year	
IPCC Sector or other	
1.	
2.	
3.	
4.	
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Figure A6-2. *Register for errata*

Annex 7 Uncertainty

Description of methodology used for uncertainty calculation

The first uncertainty calculation for the Hungarian greenhouse gas inventory was reported in 2006 for the year 2004 to fulfill the IPCC requirements for a complete emission inventory. “Uncertainty estimates are an essential element of a complete emissions inventory. Uncertainty information is not intended to dispute the validity of the inventory estimates. but to help prioritise efforts to improve the accuracy of inventories in the future and guide decisions on methodological choice.” (IPCC, 2000)

There are two methods for the uncertainty estimation suggested by the IPCC Good Practice Guidance (2000), a basic method (Tier 1) which is mandatory and an analytic one (Tier 2). The uncertainty analysis for the Hungarian inventory was carried out on the basis of Tier 1 method without the LULUCF sector since uncertainty estimates for activity data are not available for this sector.

The uncertainty calculation was performed using Table 6.1 of the IPCC Good Practice Guidance (2000). The disaggregation of the inventory into categories was the same as used for key category analysis (*Table A1-1*).

The calculations of the emissions estimates uncertainty are presented, without the sector of LULUCF, in *Table A7-1*.

Table A7-1. *Uncertainty calculation without LULUCF, Tier 1 method*

CRF code	IPCC source category	Direct green-house gas	Base year emission (Gg CO_2 eq.)	Current year (2005) emission (Gg CO_2 eq.)	Activity data uncer-tainty (%)	Emission factor uncer-tainty (%)	Combined uncertainty (%)	Combined uncertainty as % of total emissions in 2005
	A	B	C	D	E	F	G	H
			Input data	Input data	Input data	Input data	$\sqrt{E^2+F^2}$	$\frac{G \cdot D}{\sum D}$
1. A	Stationary Combustion - Gas	CO_2	20,787.96	27,980.57	5	5	7.071	2.466
1. A	Stationary Combustion - Coal	CO_2	34,678.65	13,149.58	2	5	5.385	0.883
1. A	Stationary Combustion - Oil	CO_2	16,628.08	5,062.38	2	5	5.385	0.340
1. A	Non-CO_2 Emission from Stationary Fuel Combustion	N_2O	832.21	475.27	3	50	50.090	0.297
1. A	Non-CO_2 Emission from Stationary Fuel Combustion	CH_4	576.91	337.70	3	8	8.544	0.036
1. A	Stationary Combustion - Other Fuel	CO_2	51.32	64.88	5	10	11.180	0.009
1. A. 3	Mobile Combustion - Other	CO_2	762.19	173.34	5	15	15.811	0.034
1. A. 3	Mobile Combustion	N_2O	112.10	424.77	5	100	100.125	0.530
1. A. 3	Mobile Combustion	CH_4	45.35	28.22	5	50	50.249	0.018
1. A. 3. B	Mobile Combustion - Road	CO_2	6,807.45	11,603.23	5	5	7.071	1.023
1. B. 1	Fugitive Emissions from Coal Mining and Handling	CH_4	923.02	21.92	3	10	10.440	0.003
1. B. 1	Fugitive Emissions from Coal Mining and Handling	CO_2	3.60	0.00	3	10	10.440	0.000
1. B. 2	Fugitive Emissions from Oil and Gas Operations (Main Source: Gas Distribution)	CH_4	1,601.78	2,048.12	2	50	50.040	1.278
1. B. 2	Fugitive Emissions from Oil and Gas Operations	CO_2	195.68	84.92	100	80	128.062	0.136
2.	N_2O Emission from Industry	N_2O	4,541.51	1,940.98	2	10	10.198	0.247
2.	CH_4 Emission from Industry	CH_4	7.84	14.56	1	20	20.025	0.004
2. A. 1	CO_2 Emissions from Cement Production	CO_2	1,765.31	1,198.75	2	2	2.828	0.042

Table A7-1. *Uncertainty calculation without LULUCF, Tier 1 method*

CRF code	IPCC source category	Direct green-house gas	Base year emission (Gg CO_2 eq.)	Current year (2005) emission (Gg CO_2 eq.)	Activity data uncer-tainty (%)	Emission factor uncer-tainty (%)	Combined uncertainty (%)	Combined uncertainty as % of total emissions in 2005
	A	B	C	D	E	F	G	H
			Input data	Input data	Input data	Input data	$\sqrt{E^2+F^2}$	$\frac{G \cdot D}{\sum D}$
2. A. 2	CO_2 Emissions from Lime Production	CO_2	645.03	323.14	5	2	5.385	0.022
2. A. 3	CO_2 Emission from Limestone and Dolomit Use	CO_2	248.68	332.49	2	1	2.236	0.009
2. A. 7	CO_2 Emission from Other Mineral Products	CO_2	529.48	338.33	10	50	50.990	0.215
2. B. 1	CO_2 Emissions from Ammonia Processes	CO_2	1,995.97	822.38	2	2	2.828	0.029
2. B. 3	CO_2 Emissions from Nitric Acid Production	CO_2	0.082	0.080	2	2	2.828	0.000
2. C	CO_2 Emissions from Metal Production	CO_2	641.57	310.72	2	5	5.385	0.021
2. C. 3	PFCs Emissions	PFCs	166.82	209.39	1	2	2.236	0.006
2. F	Emissions from Substitutes for Ozone Depleting Substances	HFCs	1.74	517.58	10	20	22.361	0.144
2. F. 7	SF_6 Emissions from Electrical Equipment	SF_6	70.15	201.02	10	2	10.198	0.026
3.	N_2O Emission from Solvent and Other Product Use	N_2O	253.77	82.75	2	1	2.236	0.002
3.	CO_2 Emission from Solvent and Other Product Use	CO_2	130.68	65.49	10	20	22.361	0.018
4. A	CH_4 Emissions from Enteric Fermentation in Domestic Livestock	CH_4	3,234.36	1,472.70	2	20	20.100	0.369
4. B	CH_4 Emissions from Manure Management	CH_4	889.57	410.17	2	20	20.100	0.103
4. B	N_2O Emissions from Manure Management	N_2O	2,402.54	1,127.39	2	20	20.100	0.282
4. C	CH_4 Emission from Rice Cultivation	CH_4	50.54	11.19	2	30	30.067	0.004
4. D. 1	Direct N_2O Emissions from Agricultural Soils	N_2O	6,043.45	3,230.41	20	50	53.852	2.169
4. D. 2	Animal Production	N_2O	390.92	200.91	2	20	20.100	0.050
4. D. 3	Indirect N_2O Emissions from Nitrogen Used in Agriculture	N_2O	4,425.50	2,011.70	5	50	50.249	1.260

Table A7-1. *Uncertainty calculation without LULUCF, Tier 1 method*

CRF code	IPCC source category	Direct green-house gas	Base year emission (Gg CO_2 eq.)	Current year (2005) emission (Gg CO_2 eq.)	Activity data uncer-tainty (%)	Emission factor uncer-tainty (%)	Combined uncertainty (%)	Combined uncertainty as % of total emissions in 2005
	A	B	C	D	E	F	G	H
			Input data	Input data	Input data	Input data	$\sqrt{E^2+F^2}$	$\frac{G \cdot D}{\sum D}$
4. F	Field Burning of Agricultural Residues	CH_4	45.51	0.00	10	100	100.499	0.000
4. F	Field Burning of Agricultural Residues	N_2O	13.34	0.00	10	200	200.250	0.000
6. A	CH_4 Emissions from Solid Waste Disposal Sites	CH_4	1,917.30	2,858.10	10	30	31.623	1.127
6. B	Emissions from Wastewater Handling	CH_4	847.03	574.02	20	30	36.056	0.258
6.	Emissions from Wastewater Handling	N_2O	207.70	210.80	10	1000	1000.050	2.628
6. C	Non-biogenic CO_2 from Waste	CO_2	97.62	297.23	10	20	22.361	0.083
6. C	N_2O Emissions from Waste Incineration	N_2O	0.69	1.66	5	100	100.125	0.002

Note A

$$\frac{0.01 \cdot D_x + \sum D_i - (0.01 \cdot C_x + \sum C_i)}{(0.01 \cdot C_x + \sum C_i)} \cdot 100 - \frac{\sum D_i - \sum C_i}{\sum C_i} \cdot 100$$

Table A7-2. *Uncertainty calculation without LULUCF, Tier 1 method*

CRF code	IPCC source category	Direct green-house gas	Type A sensitivity (%)	Type B sensitivity (%)	Uncertainty in trend in emissions introduced by emission factor uncertainty (%)	Uncertainty in trend in emissions introduced by activity data uncertainty (%)	Uncertainty introduced into the trend in total emissions (%)
	A	B	I	J	K	L	M
	$\sqrt{K^2+L^2}$		Note A	$\frac{D}{\sum C}$	I·F	$J \cdot E \cdot \sqrt{2}$	
1. A	Stationary Combustion - Gas	CO_2	0.117	0.242	0.585	1.712	1.809
1. A	Stationary Combustion - Coal	CO_2	-0.094	0.114	-0.471	0.322	0.571
1. A	Stationary Combustion - Oil	CO_2	-0.056	0.044	-0.280	0.124	0.306
1. A	Non-CO_2 Emission from Stationary Fuel Combustion	N_2O	-0.001	0.004	-0.044	0.017	0.048
1. A	Non-CO_2 Emission from Stationary Fuel Combustion	CH_4	-0.001	0.003	-0.004	0.012	0.013
1. A	Stationary Combustion - Other Fuel	CO_2	0.000	0.001	0.003	0.004	0.005
1. A. 3	Mobile Combustion - Other	CO_2	-0.003	0.001	-0.046	0.011	0.047
1. A. 3	Mobile Combustion	N_2O	0.003	0.004	0.300	0.026	0.301
1. A. 3	Mobile Combustion	CH_4	0.000	0.000	-0.001	0.002	0.002
1. A. 3. B	Mobile Combustion - Road	CO_2	0.059	0.100	0.297	0.710	0.770
1. B. 1	Fugitive Emissions from Coal Mining and Handling	CH_4	-0.005	0.000	-0.054	0.001	0.054
1. B. 1	Fugitive Emissions from Coal Mining and Handling	CO_2	0.000	0.000	0.000	0.000	0.000
1. B. 2	Fugitive Emissions from Oil and Gas Operations (Main Source: Gas Distribution)	CH_4	0.008	0.018	0.405	0.050	0.408
1. B. 2	Fugitive Emissions from Oil and Gas Operations	CO_2	0.000	0.001	-0.035	0.104	0.110
2.	N_2O Emission from Industry	N_2O	-0.010	0.017	-0.105	0.048	0.115
2.	CH_4 Emission from Industry	CH_4	0.000	0.000	0.002	0.000	0.002
2. A. 1	CO_2 Emissions from Cement Production	CO_2	0.000	0.010	0.000	0.029	0.029

Table A7-2. *Uncertainty calculation without LULUCF, Tier 1 method*

CRF code	IPCC source category	Direct green-house gas	Type A sensitivity (%)	Type B sensitivity (%)	Uncertainty in trend in emissions introduced by emission factor uncertainty (%)	Uncertainty in trend in emissions introduced by activity data uncertainty (%)	Uncertainty introduced into the trend in total emissions (%)
	A	B	I	J	K	L	M
	$\sqrt{K^2+L^2}$		Note A	$\frac{D}{\sum C}$	I·F	$J \cdot E \cdot \sqrt{2}$	
2. A. 2	CO_2 Emissions from Lime Production	CO_2	-0.001	0.003	-0.002	0.020	0.020
2. A. 3	CO_2 Emission from Limestone and Dolomit Use	CO_2	0.001	0.003	0.001	0.008	0.008
2. A. 7	CO_2 Emission from Other Mineral Products	CO_2	0.000	0.003	-0.013	0.041	0.043
2. B. 1	CO_2 Emissions from Ammonia Processes	CO_2	-0.005	0.007	-0.010	0.020	0.022
2. B. 3	CO_2 Emissions from Nitric Acid Production	CO_2	0.000	0.000	0.000	0.000	0.000
2. C	CO_2 Emissions from Metal Production	CO_2	-0.001	0.003	-0.006	0.008	0.010
2. C. 3	PFCs Emissions	PFCs	0.001	0.002	0.002	0.003	0.003
2. F	Emissions from Substitutes for Ozone Depleting Substances	HFCs	0.004	0.004	0.089	0.063	0.110
2. F. 7	SF_6 Emissions from Electrical Equipment	SF_6	0.001	0.002	0.003	0.025	0.025
3.	N_2O Emission from Solvent and Other Product Use	N_2O	-0.001	0.001	-0.001	0.002	0.002
3.	CO_2 Emission from Solvent and Other Product Use	CO_2	0.000	0.001	-0.004	0.008	0.009
4. A	CH_4 Emissions from Enteric Fermentation in Domestic Livestock	CH_4	-0.007	0.013	-0.134	0.036	0.138
4. B	CH_4 Emissions from Manure Management	CH_4	-0.002	0.004	-0.036	0.010	0.037
4. B	N_2O Emissions from Manure Management	N_2O	-0.005	0.010	-0.093	0.028	0.097
4. C	CH_4 Emission from Rice Cultivation	CH_4	0.000	0.000	-0.006	0.000	0.006
4. D. 1	Direct N_2O Emissions from Agricultural Soils	N_2O	-0.008	0.028	-0.417	0.791	0.894
4. D. 2	Animal Production	N_2O	-0.001	0.002	-0.012	0.005	0.013
4. D. 3	Indirect N_2O Emissions from Nitrogen Used in Agriculture	N_2O	-0.009	0.017	-0.458	0.123	0.475

Table A7-2. *Uncertainty calculation without LULUCF, Tier 1 method*

CRF code	IPCC source category	Direct green-house gas	Type A sensitivity (%)	Type B sensitivity (%)	Uncertainty in trend in emissions introduced by emission factor uncertainty (%)	Uncertainty in trend in emissions introduced by activity data uncertainty (%)	Uncertainty introduced into the trend in total emissions (%)
	A	B	I	J	K	L	M
	$\sqrt{K^2+L^2}$		Note A	$\frac{D}{\sum C}$	I·F	$J \cdot E \cdot \sqrt{2}$	
4. F	Field Burning of Agricultural Residues	CH_4	0.000	0.000	-0.027	0.000	0.027
4. F	Field Burning of Agricultural Residues	N_2O	0.000	0.000	-0.016	0.000	0.016
6. A	CH_4 Emissions from Solid Waste Disposal Sites	CH_4	0.013	0.025	0.396	0.350	0.529
6. B	Emissions from Wastewater Handling	CH_4	0.000	0.005	-0.004	0.140	0.141
6. B	Emissions from Wastewater Handling	N_2O	0.001	0.002	0.577	0.026	0.577
6. C	Non-biogenic CO_2 from Waste	CO_2	0.002	0.003	0.040	0.036	0.054
6. C	N_2O Emissions from Waste Incineration	N_2O	0.000	0.000	0.001	0.000	0.001

Annex 8 List of abbrevations and units

Abbrevations

CORINAIR	CORe INventory of AIR emissions
CRF	common reporting format
EF	emission factor
ERT	expert review team
EU	European Union
ETS	Emission Trading Scheme
GDP	gross domestic product
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
KSH	Hungarian Central Statistical Office (Központi Statisztikai Hivatal)
KTI	Institute for Transport Sciences (Közlekedéstudományi Intézet Kht.)
LULUCF	land use, land-use change and forestry
LPG	liquified petroleum gas
MVM Rt.	Hungarian Power Companies Ltd.
NCV	net calorific value
QA	quality assurance
QC	quality control
UNFCCC	United Nations Framework Convention on Climate Change
CKD	cement kiln dust
AED	anode effect duration in minutes
AEF	number of anode effects per cellday
EAF	electric arc furnace
CE	current efficiency
BOF	basic oxygen furnace
OHF	open hearth furnace
HKVSZ	Association of Cooling and Air Conditioning Businesses (Hűtő- és Klímatechnikai Vállalkozások Szövetsége)

Chemical formulas

C	carbon
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
HFCs	hydrofluorocarbons
NMVOC	non-methane volatile organic compound
N_2O	nitrous oxide
NO_x	nitrogen oxide
PFCs	perfluorocarbons
SF_6	sulphur hexafluoride
SO_2	sulphur dioxide
$CaCO_3$	calcium carbonate, limestone
$MgCO_3$	magnesium carbonate
CaO	calcium oxide, quicklime
$Ca(OH)_2$	slack lime
NH_3	ammonia

HNO_3	nitric acid
CF_4	tetrafluoromethane
C_2F_6	hexafluoroethane

Units

PJ	petajoule (10^{15} J)
TJ	terajoule (10^{12} J)
Gg	gigagram (10^9 g)